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PRELIMINARY NOTE

ON THE

LIFE-HISTORY OF GONIONEMUS

BY

LOUIS MURBACH

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PRELIMINARY NOTE ON THE LIFE-HISTORY OF GONIONEMUS.

LOUIS MURBACH.

THE occurrence of large numbers of a striking and beautiful medusa at Woods Holl, during July and August, presented a favorable opportunity for studying the life-history of a form, only the adult stage of which is known. When it was found to be Gonionemus, discovered by A. Agassiz, in 1862, in the Gulf of Georgia, Washington, and, as far as I can find, not further described since then, I determined to follow out its development.[1]

It seems desirable to give a preliminary account of results up to this time, as the completion of the work may have to be put off until next year on account of the present scarcity of the medusae.

Agassiz's[2] diagnosis is as follows: Gonionemus, A. Agassiz. "The spherosome is an oblate spheroid, cut from pole to pole; the ovaries are in lobes alternating on the sides of the chymiferous tubes, and extending their whole length, from the digestive cavity to the circular tube; the digestive cavity is long and very flexible; the tentacles are numerous, large, and exceedingly contractile; chymiferous tubes are four in number." "Found in July, Gulf of Georgia, W. T., 1862."

In his species description he brings out other features for recognizing the medusae. Such are the violet color of the lobed ovaries, a spot of the same color near the tip of each tentacle, and the fact that the tentacles are kneed at the end (serving to fasten the animal to sea-weed by means of their nettling organs). He gives the actinal diameter as $\frac{8}{10}$ of an inch.

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[1] For working facilities at the Fish Commission Laboratory during this summer, I am greatly under obligation to the Commissioner of Fish and Fisheries. Also to Dr. C. O. Whitman, the Director of the Marine Biological Laboratory, for use of library, *etc*.

[2] Illustrated Catalogue of the Museum of Comp. Zoöl. Harvard Coll., No. 11, North Am. Acalaphae.

The medusae remain rather quiet during the day unless disturbed, but become very active as darkness sets in.

Largest specimens taken were 3 cm. in diameter, and had 64 tentacles; the smallest were 6 mm. in diameter, and had 32 tentacles.

Each tentacle is bent near the end on account of a pad of cement cells on the oral side, by means of which the animal fastens itself to foreign objects. It does not use its nettling organs for this purpose, as Agassiz supposed.

The color varies from deep brown or orange to paler shades, except the chymiferous tubes, which are always dark. The tips of the tentacle frequently are a deep pink.

These medusae are said to have occurred here last year in small numbers in the Eel Pond, a small body of water containing about five acres, with only one outlet into the Harbor. This year as many as two hundred were taken in one evening with the tow-net. They were so much sought after as specimens that it is now difficult to find enough for completing the work.

When seen from the aboral side in the water they are at once conspicuous by the cross formed by their gonads, by the bright green pigment-spot at the base of the tentacles, and by the radiating brown tentacles.

The females are usually darker than the males. This may be due to an abundance of ripe eggs on the periphery of the ovarian folds. The pigment to which the general color of the gonads is due lies in the deeper portion of the gonads.

Eggs and sperm are dehisced from the outside of the gonads by the breaking up of the epithelium.

Dehiscence occurs normally about one hour after twilight — about 8 o'clock at this season of the year. Repeated experiments show that it is dependent on the withdrawal of light, since medusae taken at any time of the day, when placed in the dark for about an hour, deposited sperm and eggs.[1]

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[1] Brooks (in "The Life-History of Hydromedusae," *Mem. of the Boston Soc. of Nat. History*, vol. III, No. 12) is inclined to think that marine animals deposit

This discovery made it very convenient for obtaining different stages of segmentation during day-time.

The eggs are spherical granular bodies .08 of a mm. in diameter, and of light brown color. The nucleus is large and usually lies near the periphery of the freshly deposited egg. No egg-membrane could be demonstrated in such eggs until some time after fertilization. As polar bodies were seen on only a few occasions, it is probable that they had formed very early and passed off rapidly. They are minute, and cling together.

The spermatozoa are conical bodies 3 microns long, and 1½ microns broad, slightly constricted near the posterior end, to which a very delicate tail 70 to 100 microns long is attached. In the constricted portion of the body four deeply stainable bodies may be seen from the end to which the tail is attached.

Segmentation begins about 1½ hours after deposition of the eggs. It is total and equal — especially in the earlier stages. The first four segmentation planes divide the egg into 2, 4, 8, and 16 cells, at intervals of about 45 minutes. From this time on, segmentation is not so regular. The cells become columnar, and are arranged around a small cavity giving rise to a blastula. This becomes ciliated and rotates in the egg-membrane, in some cases with watch hands, and in others, in an opposite direction. The blastula pushes out one pole somewhat, and, working its way out of the egg-membrane, it becomes a pear-shaped, free-swimming planula, in from 12 to 20 hours from the beginning of segmentation.[1] The larger end goes foremost. It may persist in this stage for several days or for only 40 hours. Then it elongates, loses its cilia, and attaches by the end corresponding to the larger end of the planula. There now has been a differentiation into ectoderm and endoderm, the latter being formed by multipolar budding of cells in the segmentation cavity. Nettling organs are formed

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their eggs at definite hours of the day. He cites four medusae that deposit eggs regularly at 8 P.M. It would be interesting to learn whether any besides Gonionemus can be induced by artificial darkness to deposit during the day-time.

[1] Under certain conditions the ciliated free-swimming stage was entirely omitted, but as this abbreviated development is not yet understood, I defer an account of it until later.

in the ectoderm, and migrate toward the free end of the larva — corresponding with the pointed end of the planula. Usually two opposite tentacles bud out next, though many cases have been observed where only one appeared, and others where two tentacles appeared at right angles to each other.

Thus we have arrived at a hydrula stage, and, so far as this goes, we have true alternation of generations.

Woods Holl, Mass.,
August 20, 1895.

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